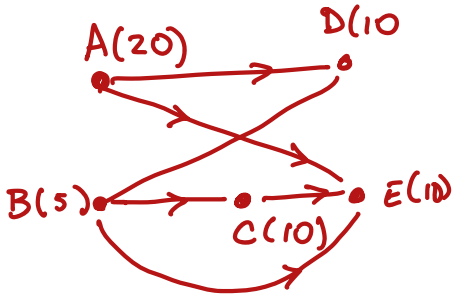
Goal Learn about the following terminology: schedule, digraph, processors, finishing time, optimal finishing time, optimal schedule, idle time, critical path, critical time.

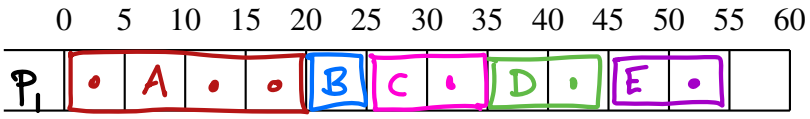
1. **Motivating Example** Fixing a Flat Bike Tire

label	task	time	dependence
A	buy a replacement tube patch kit	20 minutes	
B	find tools	5 minutes	
C	remove tire and tube	10 minutes	B
D	replace tire and new tube	10 minutes	C, B, A
E	repair old tube	10 minutes	C, B, A



(a) Schedule with one processor

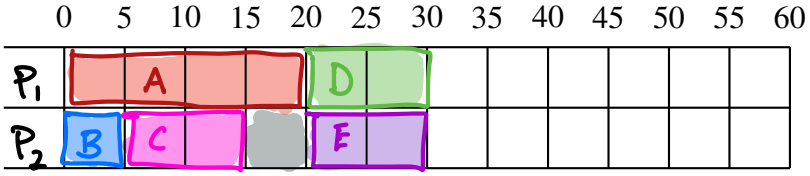
total time: 55 min



(b) Schedule with two processors

total time: 30 min ← 25 minutes faster with 2 processors!

time	0	5	15	20	30
done		B	C	A	D, E
ready	A, B	C		DE	

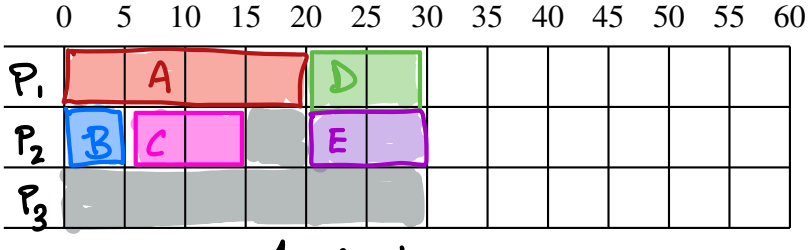


↳ 5 minutes idle time

(c) Schedule with three processors

total time: 30 min

time	0	5	15
done		B	C
ready	A, B	C	DE



↳ idle!

More processors doesn't necessarily make things go faster!

2. Terminology

(a) **schedule**

An ordering of tasks that match dependencies

(b) **digraph**

Model where
- vertices are tasks
- vertices are labeled w/ time
- draw (directed edge) from V → W if task W can't be started until V is completed

(c) **processors**

people/machines/entities completing tasks

(d) **finishing time**

time to complete all the tasks

(e) **optimal finishing time and optimal schedule**

shortest finishing time / schedule that completes in the shortest possible time

(f) **idle time**

time when processors are not completing tasks

(g) **critical path**

the longest path in the digraph, measured by summing time = vertex weights

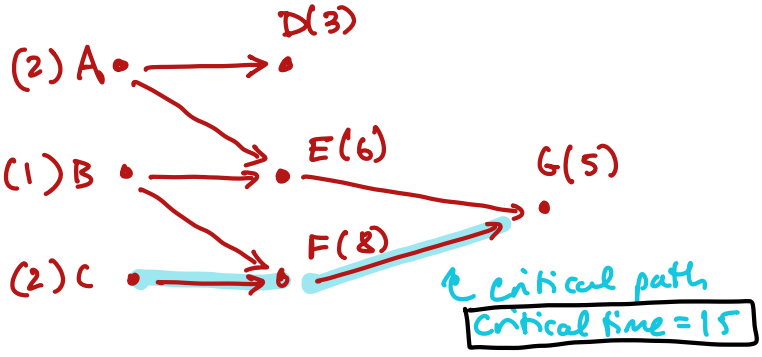
(h) **critical time**

length (sum of weights) of the critical path.

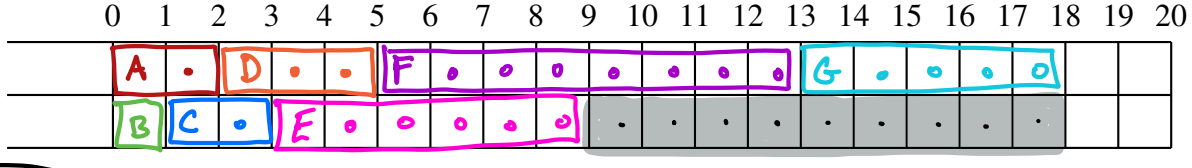
* Shortest possible time, no matter how many processors!

3. **General Example**: Create a digraph. Make a valid schedule with TWO processors. Determine values of finishing time, idle time and critical time.

label/task	time	dependence
A	2	
B	1	
C	2	
D	3	A
E	6	A, B
F	8	B, C
G	5	E, F



time	0	1	2	3	5	9	13	18
done		B	A	C	D	E	F	G
ready	A, B, C		D, E	F			G	



Finishing time = 18

9 units of idle time!